Fisheries and Oceans Canada | Pêches et Océans Canada
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Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2017/027

SCALLOP FISHERY AREA/TIME CLOSURE TO PROTECT COD SPAWNING AGGREGATIONS IN 5Z (GEORGES BANK)

Context

The requirement to account for all fishing mortality of Georges Bank Atlantic Cod (*Gadus morhua*) in Canada has led to efforts by the offshore Scallop fishery to reduce Cod bycatch. Along with active avoidance protocols adopted by the offshore Scallop fleet, Fisheries and Oceans Canada (DFO) has implemented area/time closures from early February to the end of March since 2005. This closure is implemented to reduce bycatch and minimize disturbance to spawning aggregations of Cod by the offshore Scallop fishery on Georges Bank. To assist resource managers in determining appropriate area closures for the offshore Scallop fishery on Georges Bank during the Cod spawning seasons, fisheries management asked the following question: "What does a review of eastern Georges Bank (Unit Areas 5Zj and m) Cod distribution, particularly at spawning time, reveal about the spatial trends of the species and its overlap with the offshore Scallop fishery? Highlight potential areas of high 5Zjm Cod concentration using the cells previously defined and used."

This Science Response provides information on the spatial distribution of Cod abundance on eastern Georges Bank during the spawning period based upon the DFO Winter Research Vessel (RV) survey and its overlap with Scallop catches on the Canadian portion of Georges Bank. In the 2013 analysis, the most recent 10-year spatial distribution of Cod was compared to the whole time series (starting in 1996). The results of this analysis showed that a change in distribution had occurred (DFO 2013). It was determined that using the most recent 10-year moving window to examine the spatial trends of Cod distribution during the spawning period should achieve the objective of reducing Cod bycatch and disturbance of spawning aggregations. Therefore, this analysis uses data on Cod distribution from 2007 to 2016.

This Science Response Report results from the Science Response Process of January 23, 2017, on the Status Update of Scallop Fishery Area Closures on Georges Bank to Protect Cod Spawning Aggregations.

Analysis and Response

The 2016 first quarter Canadian offshore Scallop catches on Georges Bank correspond to approximately 25% (745 metric tonnes (mt) of meats) of the Total Allowable Catch (TAC) for the year, which is above the long-term average percentage for the first quarter (18% since 1990).

The information used in this analysis has been updated with the 2016 Cod abundance data on eastern Georges Bank obtained from the annual DFO Winter RV survey, as well as Scallop catches from the Canadian offshore Scallop fishery logbooks. Details on the methods for this analysis can be found in the Maritimes Region Science Expert Opinion 2006 (DFO 2006). Information from the DFO Winter RV survey for 5Zjm conducted during late February/early March was used to identify areas of high aggregations of adult (Age 3+) Cod. The distribution of Age 3+ Cod was plotted on a grid of 5-minute longitude by 3.33-minute latitude cells (approximately 12.5 nautical miles^2 or 43 km^2 per cell). Cod abundance data were

"standardized" by dividing the number of Cod per tow by the mean number per tow for the strata representing 5Zjm for each year of the survey. These standardized estimates were averaged in each cell over the 2007 to 2016 time period. This has the effect of diluting the influence of very large tows and reducing between-year variability. In a previous analysis, the most recent 10-year spatial distribution was compared to the whole time series (starting in 1996). This comparison showed that a change in distribution had occurred, indicating that the full time series did not adequately reflect recent changes in Cod distribution (DFO 2013).

The cells with an average of 3.5 or more standardized Age 3+ Cod/tow for the last decade were numbered 1 to 15 in order of decreasing abundance (Figure 1). These cells were compared to 2016 first quarter (Q) Scallop catches (Table 1). Of the 14 cells ranked in the previous year's analysis, 12 remained as ranked cells in this analysis. Cells 7, 12, and 13 in this analysis were not ranked last year.

The 2016 Scallop fishery Cod closure contained 5 currently ranked cells (see asterisks for cells 1, 2, 3, 4 and 10; see Variation Order 2016-013). The strongest aggregation of Cod occurred in an area near the center of the Bank; however, there were also noteworthy high density cells of Age 3+ Cod on the southern part of the Bank (cells ranked 3, 4 and 7).

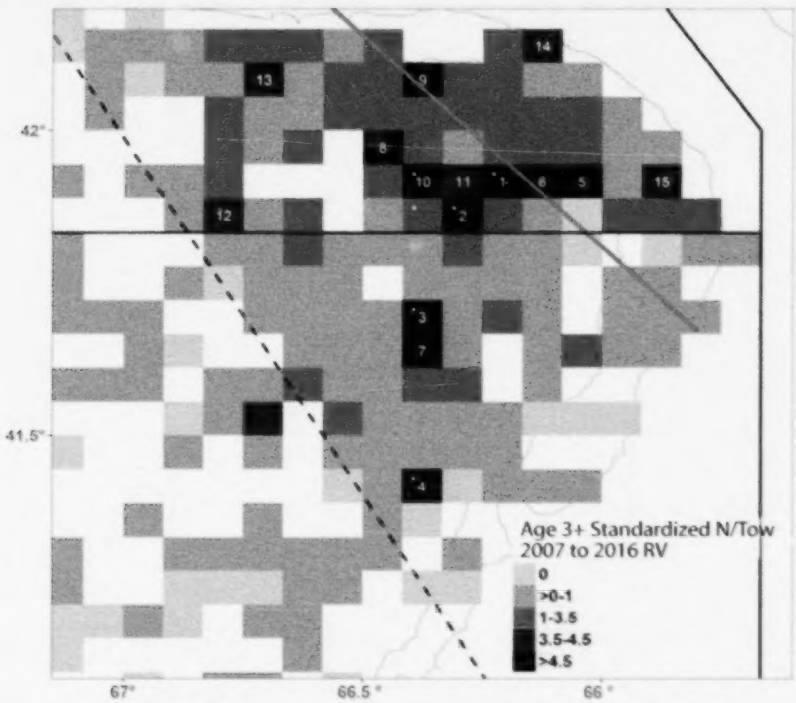


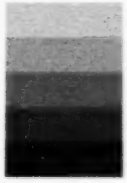
Figure 1. Distribution of aggregated Age 3+ Cod on eastern Georges Bank in late February/early March from DFO Research Vessel survey data (2007 to 2016). The number per tow (N/tow) has been standardized by dividing the N/tow by the mean N/tow for the whole area, i.e., 5Zjm, for each year of the survey and then averaged in each cell from 2007 to 2016. Cells representing 3.5 or more standardized N/tow were ranked (highest to lowest, Canadian side only). Cells that were part of the 2016 Scallop-fishery Cod closure are indicated by an asterisk (*).The horizontal black solid line demarcates Northwest Atlantic Fisheries Organization divisions 5Zj and 5Zm. The diagonal red solid line demarcates the Georges Bank Scallop management areas 'a' and 'b'. The diagonal dashed line indicates the Canada/USA International Court of Justice line.

Table 1. Association between 2016 eastern Georges Bank first quarter Scallop catch (mt of meats) by the Canadian offshore Scallop fleet and cells of high Cod density (cells with 3.5 or more standardized Age 3+ Cod on average in DFO Winter Research Vessel survey data from 2007 to 2016). The Cod cells, numbered 1 to 15, are in descending order of Cod abundance. Greyscale rankings indicate the abundance of Scallop catch that corresponds to each cell of high Cod density.

	Cod Cell Number														
Year	**1***	**2***	**3***	**4***	**5**	**6**	**7**	**8**	**9**	**10***	**11**	**12**	**13**	**14**	**15**
2016	1	2	0	0	0	0	0	8	0	0	173	8	29	0	0
2015	2	0	0	0	0	0	0	7	0	0	0	0	2	0	0
2014	0	0	0	0	0	0	0	96	7	0	0	7	17	0	0
2013	0	0	0	0	0	1	0	4	7	0	0	0	25	0	0
2012	11	26	0	0	0	0	1	1	0	12	4	0	10	0	0
2011	0	26	0	0	0	0	0	7	0	6	8	0	1	0	0
2010	1	4	0	0	0	0	0	12	0	0	0	8	1	0	0
2009	9	1	0	0	0	0	0	32	12	4	2	21	1	0	0
2008	110	58	0	0	0	0	0	35	55	0	84	4	10	0	0
2007	2	1	0	0	0	0	0	373	0	1	0	0	0	0	0

** indicates cells that were part of the 2016 closure*

Legend: Scallop Catch
Colour: Scallop Catch (mt of meats)



Six of the top 15 ranked Cod cells had Scallop landings in Q1 of 2016 (cells 1,2,8,11,12 and 13, Table 1). These cells had a total of 232 mt of catch for this period (approximately 31% of the total Canadian Q1 Scallop catch of 745 mt on Georges Bank).

The cells selected for closure in 2016 (see asterisks in Figure 2) had low Q1 Scallop landings prior to the closure, which began on February 8, 2016. A closure based on the top ranking cells would have a relatively low impact on the offshore Scallop fishery if the 2017 Q1 Scallop fishing distribution is similar to that of the first quarter in 2016 (Figure 2). This low impact may be the result of the displacement of Scallop fishing to other areas in the first quarter, perhaps due to the Cod area/time closures.

If Scallop fishing in Q1 is confined primarily to 5Zj, as in 2016, closure of cells ranked 1, 2, and 3 would have little effect on Scallop catches.

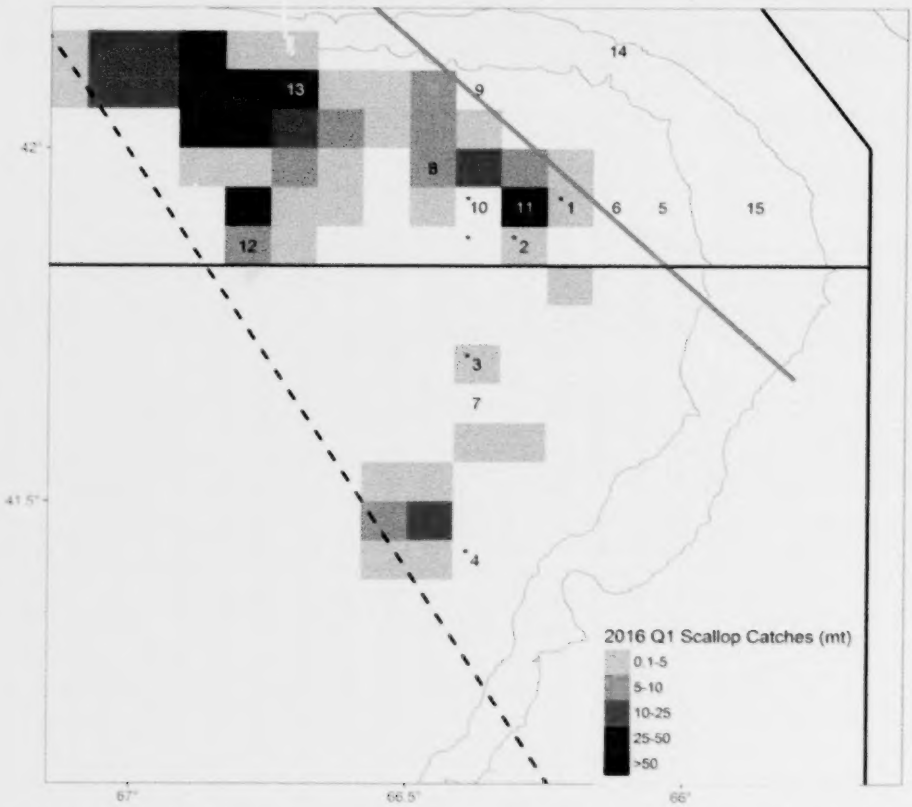


Figure 2. Distribution of eastern Georges Bank offshore Scallop catches (mt of meat) by the Canadian Scallop fishery during the first quarter of 2016. The 3 darkest cells have values of 173, 84 and 79 mt). There were no industry-initiated Scallop-fishery closure areas in place for the first quarter of the 2016 Scallop fishery. The horizontal black solid line demarcates NAFO divisions 5Zj and 5Zm. The diagonal red solid line demarcates the Georges Bank Scallop management areas 'a' and 'b'. The diagonal dashed line indicates the Canada/USA International Court of Justice line. Numbers 1 to 15 represent the ranked Cod cells from Figure 1.

Conclusions

A Cod area/time closure based on the top ranking cells would have a relatively low impact on the offshore Scallop fishery provided the 2017 first quarter Scallop fishing distribution is similar to that of the first quarter in 2016.

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Sources of Information

DFO. 2006. Science Expert Opinion on Scallop Fishery Area/Time Close - 2006. Mar. Reg. Expert Opin. 2006/05.

DFO. 2013. Scallop Fishery Area/Time Closure to Protect Cod Spawning Aggregations in 5Z (Georges Bank). DFO Can. Sci. Advis. Sec. Sci. Resp. 2013/008.

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